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<p>(54) Title: CONDITIONAL ACCESS SYSTEM FOR LOCAL STORAGE DEVICE</p>			
<p>(57) Abstract</p> <p>A technique for selectively inhibiting a video recorder (7) from recording and/or reproducing those television programs, which are not authorized for viewing on the viewing device (8). Authorization data associated with respective television programs that are receivable by the recorder (7) and indication whether that program is authorized for recording and/or reproduction, is received by the recorder (7) or to (or multiplexed with) the television program and is stored thereat. When the television program is received at the receiver (6) and the recorder (7), the stored authorization data associated with that is read to determine if the received television program is authorized for recording and/or reproduction. If not, the recorder (7) is inhibited from recording and/or reproducing that unauthorized television program.</p>			

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CONDITIONAL ACCESS SYSTEM FOR LOCAL STORAGE DEVICEBACKGROUND OF THE INVENTION

This invention relates to selectively inhibiting television receiving apparatus from recording 5 programs, received as digital video data, which are not authorized for viewing.

Techniques have been proposed heretofore to permit viewers to selectively enable and disable television receiving apparatus to prevent unauthorized 10 television programming from being recorded and/or reproduced. With the introduction of the digital image communication systems such as the digital cable TV (CATV) systems, many services can be provided that were previously unheard of with the conventional TV 15 broadcasting and CATV systems. The digital CATV systems not only provide conventional TV images, but can provide such services as electronic mail and electronic banking.

In the digital image communication systems, image storage devices are preferably incorporated into a 20 conventional television receiving apparatuses. This enables the viewer to watch a television program on a particular channel while simultaneously recording television programs then being broadcasted on other channels in the image storage device; which can be 25 reproduced later by the viewer.

The digital cassette tape recorder (hereinafter referred to as digital VCR) performs processing, such as parity code addition, ECC, formatting, modulating and so forth on video signals that have been highly efficiently 30 coded. Thereafter, one or more rotating heads of the digital cassette tape recorder records the digital video signals on a magnetic tape. The digital cassette tape recorder also performs playback processing, such as demodulating, format decomposing, error correction and so 35 forth on the signals played back from the magnetic tape so as to reproduce the digital video signals.

The digital cassette tape recorder may be incorporated into a conventional television receiver or into a decoder of the type typically used in cable television or direct satellite broadcast systems. Such 5 decoders or converters are known and, consistent with industry usage, are referred to herein, as set-top converters.

In addition, in the digital CATV system, data in which a plurality of programs have been time-division 10 multiplexed are transmitted. Normally, one program channel is selected by a television receiving device to display or store the program on that selected channel. However, programs broadcast on other channels at the same time as the selected program cannot be viewed or recorded 15 for later viewing by that television receiving device. Thus, it is desirable to record those programs so they can be viewed later by the subscriber.

It is also desirable to record programs, such as movies, feature presentations, pay-per-view, etc., 20 transmitted from the source during off-hours, e.g., midnight, so those programs subsequently can be viewed by the subscriber upon receiving proper authorization.

OBJECTS OF THE INVENTION

25 Therefore, it is an object of the present invention to provide a technique by which television receiving apparatus is selectively inhibited from recording those programs, received as digital video data, which are not authorized for viewing.

30 Another further object of this invention is to provide a technique by which television receiving apparatus is selectively inhibited from reproducing those programs, recorded as digital video data, which are not authorized for reproduction.

35 A further object of this invention is to provide a technique as aforesaid, which additionally

decodes the recorded video data after reproducing it from the recording medium.

An additional object of this invention is to provide a technique by which subscribers may rent or 5 purchase videos using their television receiving apparatus.

Various other objects, advantages and features of the present invention will become readily apparent from the ensuing detailed description, and the novel 10 features will be particularly pointed out in the appended claims.

SUMMARY OF THE INVENTION

In accordance with this invention, television 15 receiving apparatus is selectively inhibited from recording those television programs which are not authorized for viewing. Program information associated with television programs that are receivable by the television receiving apparatus, such as title data 20 representing the title of that program, rating data representing the content of that program, and authorization data indicating whether that program is authorized for recording and/or reproduction, is stored in the receiving apparatus. When digital video data is 25 received by the television receiving apparatus, the authorization data associated with the television program corresponding to the received digital video data is read from memory to determine if the received television program is authorized for recording. If not, the 30 television receiving apparatus is inhibited from recording the received video data corresponding to that unauthorized television program. As described herein, a program cannot be recorded until it has been previously authorized for recording by the commercial television 35 broadcast/distribution systems provider (e.g., enablement of particular programs in pay-per-view application).

In a preferred embodiment, the received digital video data is encoded and the television receiving apparatus requires a scrambling key to decode the received digital video data. The decoded digital data is 5 then recorded on a recording medium. As a preferred feature of the present invention, the scrambling key is transmitted in encoded form from a source to the television receiving apparatus.

In accordance with another aspect of this 10 invention, television receiving apparatus is selectively inhibited from reproducing those television programs which are not authorized for viewing. When a program recorded on a recording medium is selected by the subscriber to be reproduced, the authorization data 15 associated with the selected television program corresponding to the recorded digital video data is read from memory to determine if the selected television program is authorized for reproduction. If not, the television receiving device is inhibited from reproducing 20 the recorded video data corresponding to that unauthorized television program. As described herein, a program cannot be reproduced until it has been previously authorized for reproduction by the commercial television broadcast/distribution systems provider.

25 As a preferred feature of the present invention, the recording medium contains encoded digital video data and the encoded digital video data corresponding to a selected program must be decoded before it can be viewed by the subscriber. The 30 television receiving apparatus requires a scrambling key, which is also encoded, to decode the encoded digital video data.

In accordance with yet another aspect of this invention, the recording medium is a digital video tape. 35 The authorization information associated with the programs on the video tape is also stored on that video tape. The television receiving apparatus reads from the

video tape the authorization data associated with a selected program in the event that corresponding authorization data is not present in the memory. This feature enables other television receiving apparatus to 5 reproduce authorized programs even if the authorization data associated with the selected program is not present in the memory of that other television receiving apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

10 The following detailed description, given by way of example, and not intended to limit the present invention solely thereto, will best be understood in conjunction with the accompanying drawings in which:

15 Fig. 1 is a block diagram showing a digital CATV system which incorporates the present invention;

Fig. 2 is a block diagram showing the incorporation of the present invention in television receiving apparatus;

20 Fig. 3 is a block diagram representing the manner in which a television program is encoded by the head-end controller and decoded by television receivers, for example, in a cable distribution or direct satellite broadcast system.

25 Fig. 4 is a block diagram representing another manner in which a television program is encoded by the head-end controller and decoded by the television receivers, for example, in a cable distribution or direct satellite broadcast system.

30 DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

The present invention is readily implemented by presently available television receiving apparatus and electronic components. The invention finds ready application in virtually all commercial television 35 broadcast/distribution systems, including over-the-air broadcasts, wired cable transmission systems and direct satellite broadcast systems. As is conventional, set-top

converters typically are used to receive and decode television programs that are transmitted by cable systems or by direct satellite broadcast systems. Normally, such set-top converters are not needed to decode television 5 programs that are transmitted by over-the-air systems. Set-top converters, like other television receiving devices, include tuning circuits (either analog or digital) which are operable to tune to any one of the different broadcast channels that may be received 10 thereby. For example, if the set-top converter is used in a cable transmission system over which 25 different channels of television programming are transmitted, the tuning circuitry included in the converter is adapted to select any one of such 25 channels. Similarly, if the 15 set-top converter is provided in a direct satellite broadcast system over which 150 different broadcast channels of television programming are received, the tuning circuitry included in the converter is adapted to select any one of those 150 different channels. The 20 tuning circuitry included in conventional over-the-air television receiving devices is, of course, adapted to select any of the over-the-air channels that normally are transmitted.

The present invention contemplates the 25 transmission of program information data of the type that presently is available. Typically, such program information data is transmitted on a predetermined broadcast channel separate and apart from the broadcast channels over which television programming is 30 transmitted. However, program information data that is multiplexed with television programming likewise may be transmitted. The former transmission of program information data is known as out-of-band transmission; and the present discussion refers to such out-of-band 35 transmission in over-the-air broadcast systems, cable distribution systems and direct satellite broadcast systems. In one embodiment, the program information data

includes the following information for each television program that is transmitted: the channel over which that television program is transmitted (i.e., the channel number), the name of the television program, and the 5 rating data which represents the content of that television program.

In addition to the foregoing information included in the program information data, it is a feature of the present invention also to include authorization 10 data stored in the memory of the television receiving apparatus indicating whether a television receiving apparatus is authorized to record and/or reproduce that television program. For example, the authorization data may include authorization status information indicating 15 whether the television receiving apparatus has a limited or complete authorization to reproduce a particular program. The authorization data may further include expiration date data which represents the last date the television receiving apparatus with the limited 20 authorization is authorized to reproduce that program, and price data representing the additional payment required to change the limited authorization status of the television receiving apparatus to the complete authorization status.

25 Turning now to Fig. 1, there is illustrated a block diagram of a digital CATV system which incorporates the present invention. A broadcasting station 1 transmits broadcasting signals to a satellite 2 (for example, a broadcasting or communication satellite). 30 These broadcasting signals are re-transmitted to head-ends 3 disposed in individual service areas, each of which contains an antenna to receive the broadcasting signals, a receiving amplifier, an image source input portion (if necessary), a modulator to modulate the 35 received broadcasting signals, and a multiplexer to multiplex the output of the modulator before it is output to a transmission line.

Individual homes 4, i.e., subscribers to the CATV system, are connected to the head-end 3 by a cable 5, which can be constructed as either a coaxial cable, an optical fiber cable, or a combination thereof. The cable 5 is connected in a tree shape or in a star shape. A subscriber of the CATV system (home 4) is provided with a television receiving apparatus 6, which contains a tuner 10 for selectively tuning to a desired broadcasting channel and a digital VCR 7 to record or reproduce programs. The reproduced digital video data which constitute the program reproduced from a recording medium are supplied to a display 8 whereat it is displayed to the viewer. It will be appreciated that display 8 includes the usual video processing circuitry normally provided in television receiving apparatus to permit a television picture (and accompanying audio information) to be displayed to a viewer.

The CATV system according to the present invention is not limited to the CATV system shown in Fig. 20 1. For example, a plurality of program providers can transmit programs to the satellite 2. A CATV station may be interposed between the satellite and the head-ends 3 to receive broadcasting signals from the satellite 2 and relay those signals to the head-ends by optical fiber 25 cables. Each head-end is connected to many homes by optical fiber cables or coaxial cables. In addition, the present invention may be applied to a digital image communication system (such as a TV conference system) other than the digital CATV system.

30 The digital broadcasting signal generated in the head-end 3 contains a plurality of broadcast channels which are encoded for example using motion compensated inter-frame prediction coding techniques. Highly efficient encoders are utilized in the head-end 3 (not shown) in accordance with the MPEG (Moving Picture Experts Group) system that has been adopted by the ISO (International Organization for Standardization). The

encoded broadcasting signals are then time-division multiplexed into a packet, which is digitally modulated, for example, using a PSK modulation technique.

Each packet is composed of 188 bytes with 4 bytes reserved for an ID code. The ID code preferably is positioned at the beginning of each packet of time-division multiplexed data and contains program information data.

Each broadcast channel contains a plurality of programs which are encoded so that only authorized subscribers of the CATV system can receive the broadcast programs. The encoding technique normally depends on each broadcast channel.

Fig. 2 illustrates a block diagram of television receiving apparatus 6 which incorporates the present invention. The apparatus illustrated in Fig. 2 may be included in a set-top converter, a television receiver, a video recorder or other conventional apparatus typically used to receive and cause the display of television pictures. Control signals, whether received by remote receiver (not shown) or generated by control elements provided directly on the television receiving apparatus, such as a channel selector (not shown), are coupled to a microprocessor (not shown) which controls the operation of a tuner 10 so as to tune to a selected television channel received thereby.

Although not described in detail, it will be appreciated that the microprocessor may be a conventional microprocessor, such as a relatively inexpensive, small eight-bit controller or a powerful, high-speed microprocessor for example, a "486"-type microprocessor or Pentium microprocessor manufactured by Intel Corp.

A signal of the selected channel is demodulated by a demodulator 11. If the demodulated signal contains an error attributed to the communication path, the error is corrected by a forward error correcting circuit 12. The resultant signal is supplied to a conditional access

circuit 13 to determine if that signal constitutes a program that is authorized for recording by the television receiving apparatus 6. The conditional access circuit 13 reads from a memory (not shown) the 5 authorization data associated with the program to determine if the television receiving apparatus is authorized to record that program. If there is no authorization data in the memory associated with that program, the conditional access circuit 13 disables the 10 operation of the digital VCR 7 and/or causes an indication, such as the energization of an LED (not shown), to be displayed to the subscriber, indicating that the television receiving apparatus is not authorized to record the received program. Such indication informs 15 the subscriber to access the authorization center of the cable distribution system to obtain the necessary authorization to record the program. An additional level of security is provided by disabling the digital VCR 7 to prevent unauthorized access to the digital VCR 7, i.e., 20 programs stored therein. Moreover, the subscriber may call the authorization center to purchase additional services, such as, subscribing to additional broadcast channels, pay-per-view programs, viewing videos on a pay-per-play basis where the viewer pays for each viewing of 25 the video, etc.

In one embodiment of the present invention, the subscriber is provided with a decryption device, such as in the form of a "card" similar to a credit card, a bank card, or the like, which includes decryption data as well 30 as an authorization representation recorded thereon.

Such decryption data and authorization representation may be recorded in a magnetic stripe and, thus, may be changed or updated from time to time. Other forms of recording also are contemplated, such as optical 35 recording of this information, storage in a solid state memory, etc. For convenience, the subscriber's decryption device described above is referred to herein

as a "smart card". The authorization representation that may be recorded on the smart card preferably represents a threshold monetary amount which is sufficient to pay the requisite fee for recording and/or reproducing the 5 program (or to purchase other additional services from the cable distribution system). The subscriber simply places the smart card in a smart card receiving unit 15 of the television receiving apparatus from which the requisite fee is deducted, thus obviating the need to 10 place a call to the authorization center.

If the received signal of the selected channel has been encoded (scrambled), the demodulated signal is descrambled, provided that the program represented by that signal is authorized for recording by the television 15 receiving apparatus 6. The descrambled signal is supplied to digital VCR 7 to be stored on a magnetic tape. Also, the authorization data indicating whether the television receiving apparatus is authorized to reproduce is supplied to the digital VCR 7 to be stored 20 in an authorization information area of the magnetic tape. The authorization data is desirably recorded multiple times on different tracks of the magnetic tape to insure reliability. Preferably, the authorization data is recorded twice on two different tracks of the 25 magnetic tape to insure that the authorization data is always present and accessible from the magnetic tape even if one of the tracks is damaged. The authorization area preferably is located at the beginning portion of the magnetic tape.

30 The digital VCR 7 comprises a transport layer processing circuit 20, a trick play processing circuit 21, an error correction code encoder/decoder 22, a channel encoder/decoder 23, and a tape head mechanism (or recording portion) 24. The transport layer processing 35 circuit 20 decodes data packets, each of which is composed of, for example, 188 bytes and obtains program information from the ID portion of each packet. Data

outputted by the transport layer processing circuit 18 is written to a buffer memory (not shown).

The trick play processing circuit 21 reads the data from the buffer memory and is operable to record 5 compressed image data (consistent with the MPEG system) to effect special effects such as high speed reproduction or slow reproduction. For example, when high speed reproduction is performed, the trick play processing circuit 21 records intraframe data on a track of the 10 record medium scanned by the rotating head. In the MPEG system, intraframe data is present in every predetermined number of frames.

An output signal from the trick play processing circuit 21 is supplied to error correction code 15 encoder/decoder 22, the encoding section of which performs error correction code encoding, such as adding parity data. The output from the error correction code encoder/decoder is supplied to a channel encoder/decoder 23, the encoding section of which modulates the output 20 signal of the error correction code encoder/decoder for recording. The output from the channel encoder/decoder 23, which is record data, is supplied to the tape head mechanism portion 24 for recording on the magnetic tape by a rotating head. The tape head mechanism portion 24 25 comprises a tape guide drum, a tape transport, and a servo circuit. The magnetic tape is wound around the periphery of the tape guide drum and is transported along a predetermined path. It will be seen that a data storage device, such as a hard disk, a video disk or a 30 magnetic disk, may be used with or in place of the digital VCR.

When a digital video tape is placed in the digital VCR 7, the conditional access circuit 13 determines if the television receiving apparatus is 35 authorized to reproduce the program on that video tape. The conditional access circuit 13 reads from a memory (not shown) the authorization data associated with the

program to determine if the television receiving apparatus is authorized to reproduce that program. If there is no authorization data in the memory associated with that program, then the conditional access circuit

5 reads from an authorization information area of the video tape in the digital VCR 7 and performs error correction consistent with error correction code, for example, C1 code and/or C2 code. The authorization area preferably is located at the beginning portion of the video tape.

10 The conditional access circuit 13 causes an indication, such as the energization of a LED (not shown), to be displayed to the subscriber, indicating that the television receiving apparatus is not authorized to reproduce the selected program if the authorization 15 data is not present in either the memory or the video tape in the digital VCR 7.

Such indication informs the subscriber to access the authorization center 32 (Fig. 3) of the cable distribution system to obtain the necessary authorization 20 to reproduce the selected program. If the smart card is not utilized, the subscriber must call the authorization center 32 to obtain the requisite authorization to reproduce the selected program. If a smart card initialized with a predetermined monetary threshold is 25 utilized, the subscriber simply places the smart card in smart card receiving unit 15 of the television receiving apparatus from which the requisite fee for reproducing the program is deducted, thus obviating the need to place a call to the authorization center 32.

30 If the conditional circuit 13 determines that the television receiving apparatus is authorized to reproduce the program recorded on the video tape in the digital VCR 7, the tape head mechanism 24 reproduces from the magnetic tape the video data constituting the 35 authorized program, which is decoded and demodulated by the decoding section of channel encoder/decoder 23. The decoded data is supplied to the error correction code

encoder/decoder 22, the decoding section of which performs error correction consistent with the error correction code, for example, C1 code and/or C2 code.

The decoded data is supplied to the transport 5 layer processing circuit 20 through the trick play processing circuit 21 to convert the format of the decoded data into the format of the received broadcasting signal so that the MPEG decoder 14 can read and decode the decoded data. The MPEG decoder restores the original 10 video data and supplies it to a display unit 8.

The manner in which a program received by the conditional access circuit 13 is identified as being authorized for recording is explained in conjunction with Fig. 3. If a subscriber decides to subscribe to a 15 particular channel, the subscriber places a call to the authorization center 32 of the cable distribution system requesting authorization of the subscriber's television receiving apparatus to record the programs on that channel. Authorization data from the authorization 20 center 32 is either transmitted on a predetermined broadcast channel separate and apart from the broadcast channels over which television programs are transmitted or is multiplexed with the television programs. Alternatively, with an initialized smart card, the 25 subscriber merely inserts the smart card into the smart card receiving unit 15 (shown in Fig. 2) and a microprocessor or CPU 33 of the conditional access circuit 13 deducts the appropriate subscription payment from the balance recorded on the smart card and 30 thereafter sends requests to the authorization center 32 via a modem 34 and a telephone line 29 to transmit the appropriate authorization data to the subscriber's television receiving apparatus. This obviates the need to place a call to the authorization center 32 every time 35 the subscriber wants to subscribe to additional channels.

The smart card is initialized with a predetermined monetary amount, such as \$100, in response

to the operation of a smart card initialization button (not shown) on the console of the television receiving apparatus, whereupon the microprocessor sends a smart card initialization request signal to the authorization 5 center 32 via modem 34 and telephone line 29. The appropriate authorization code is then transmitted from the authorization center 32 to the microprocessor which records the predetermined monetary amount on the smart card.

10 In one embodiment, prior to transmitting the program data to the television receiving apparatus, the program data (video data) is encoded (scrambled) at the broadcasting station by a scrambler 30 with a scrambling key K_s . Preferably, each broadcast channel has a 15 respectively different scrambling key K_s to scramble its programs. Since the television receiving apparatus 6 cannot descramble the scrambled programming data without the proper scrambling key K_s , it is necessary to transmit the scrambling key corresponding to a particular 20 broadcast channel to all television receiving apparatus authorized to receive programs on that particular channel. The television receiving apparatus stores the received scrambling keys in its memory (not shown).

When scrambled signals constituting a program 25 are supplied to the television receiving apparatus from the broadcasting station, the conditional access circuit 13 determines if those signals constitute a program that is authorized for recording by the television receiving apparatus. If the conditional access circuit 13 30 determines that the television receiving apparatus is authorized to record that program, a descrambler 35 of the conditional access circuit 13 descrambles the received program with the stored scrambling key K_s using conventional descrambling techniques. The descrambled 35 program data is then supplied to the digital VCR 7 to be recorded on a video tape.

However, there is a risk in sending the scrambling keys in their original form because they can be easily intercepted by unauthorized subscribers, who then can receive (record) programs without receiving 5 prior authorization from the authorization center 32. That is, "pirates" can view programs without paying the necessary subscription fee. Thus, in accordance with another embodiment of the present invention, the scrambling keys are encrypted (encoded or scrambled) 10 before they are transmitted to the authorized subscribers.

Prior to transmitting the program data to the television receiving apparatus, the program data is scrambled at the broadcasting station by the scrambler 30 15 with the respective scrambling key K_s which is unique to the channel transmitting that program data. The scrambling key is itself encrypted at the broadcasting station by an encryption unit 36 with a working key K_w . Preferably, each scrambling key is encrypted with a 20 respectively different working key K_w . The television receiving apparatus 6 cannot descramble the scrambled program data with the encrypted scrambling key K_s . Hence, it is necessary to transmit the working key K_w and the scrambling key K_s to enable the television receiving 25 apparatus to descramble the scrambled program data. The television receiving apparatus stores the received scrambling and working keys in its memory (not shown).

When scrambled signals constituting a program are supplied to the television receiving apparatus, the 30 conditional access circuit 13 determines if those signals constitute a program that is authorized for recording by the television receiving apparatus. If the conditional access circuit 13 determines that the television receiving apparatus is authorized to record that program, 35 a decryption unit 39 of the conditional access circuit 13 decodes (decrypts) the received scrambling key with the proper stored working key and supplies the decrypted

scrambling key K_s to the descrambler 35 of the conditional access circuit 13. Decoding (or decryption) of the scrambling key K_s is effected by conventional decryption techniques utilizing the stored working key

5 Kw. The descrambler 35 then descrambles the received program with the decrypted scrambling key K_s using conventional descrambling techniques and supplies the descrambled program data to the digital VCR 7 to be recorded on a video tape.

10 As with the scrambling keys, it is equally risky to send the working keys in their original or unencrypted form. Thus, in accordance with a further embodiment of the present invention, it is preferable to encode the working key Kw before it too is transmitted to
15 the authorized subscribers.

Prior to transmitting the program data to the television receiving apparatus, the program data is scrambled at the broadcasting station by the scrambler 30 with the respective scrambling key K_s which is unique to
20 the channel transmitting that program data. The scrambling key K_s is itself encrypted at the broadcasting station by the encryption unit 36 with the working key Kw. Preferably, each scrambling key K_s is encrypted with a respectively different working key Kw. Moreover, the
25 working key Kw is itself encoded (encrypted) at the broadcasting station by an encryption unit 37 with a personal key K_p , which is unique to each television receiving apparatus. The television receiving apparatus
6 cannot descramble the scrambled program data with the
30 encrypted scrambling key K_s . It will be appreciated, therefore, that the working and scrambling keys are also transmitted to the subscriber for each authorized channel and are stored in memory (not shown).

When scrambled signals constituting a program
35 are supplied to the television receiving apparatus, the conditional access circuit determines if those signals constitute a program that is authorized for recording by

the television receiving apparatus. If the conditional access circuit determines that the television receiving apparatus is authorized to record that program, a decryption unit 38 of the conditional access circuit 13 5 decodes the received working key K_w with the pre-stored personal key K_p using conventional decoding (decryption) techniques and supplies the decoded working key K_w to the decryption unit 39 of the conditional access circuit 13. The received scrambling key K_s is then decoded by the 10 decryption unit 39 of the conditional access circuit 13 with the decoded working key K_w likewise in accordance with conventional techniques (which may be the same as or different from K_w decryption) and the decoded scrambling key K_s is supplied to the descrambler 35 of the 15 conditional access circuit 13. The descrambler 35 then descrambles the received program data using the decoded scrambling key K_s and supplies the descrambled programming data to the digital VCR 7 to be recorded on a video tape.

20 The keys K_s and K_w may be multiplexed onto one or more, or all of the channels that are receivable by the television receiving apparatus or may be transmitted over a separate, distinct channel. The three layers of encoding/encryption/scrambling insure a high level of 25 security and prevent unauthorized recording of the transmitted programs.

Since in the embodiments described hereinabove, the program data is unscrambled prior to being recorded on the magnetic tape there is little to prevent an 30 unauthorized viewer from "tapping" the output of descrambler 35 and thereby watching the program as it is being down-loaded from the head-end 3 (shown in Fig. 1). For example, an authorized subscriber of the channel may not be authorized to receive (reproduce) a special 35 program (pay-per-view) on that channel. As another example, an authorized subscriber may want to view (reproduce) movies recorded on magnetic or video tapes on

a pay-per-play basis. However, as will be described, television receiving apparatus in accordance with the present invention may be authorized for the recording of a program, but not necessarily for the reproduction of 5 that program.

The manner in which the television receiving apparatus is prevented from reproducing a program even if it is authorized to record it is represented by the block diagram shown in Fig. 4. For simplicity, elements shown 10 in Fig. 4 corresponding to those shown in Fig. 3 are denoted by the same reference numerals and their description is omitted.

Depending on the method employed, the head-end 3 (shown in Fig. 1) either transmits the appropriate 15 authorization data on a predetermined broadcast channel separate and apart from the broadcast channels over which program data is transmitted or multiplexes the authorization data with the program data transmitted to the subscriber on the respective broadcast channels.

20 Prior to encoding the program data as described hereinabove with respect to Fig. 3, the program data is encoded (scrambled) to prevent an authorized viewer from "tapping" the output of descrambler 35 and thereby watching the program as it is being down-loaded from its 25 head-end 3. Thus, in accordance with yet another embodiment of the present invention, prior to encoding the program data as described hereinabove with respect to Fig. 3, the program data is encoded (scrambled) by a scrambler 41 (Fig. 4) with a modification key K_m .

30 Preferably, each program is scrambled with a respectively different modification key K_m . Since the television receiving apparatus cannot descramble the scrambled program data without the proper modification key K_m , it is necessary to transmit the modification key K_m 35 associated with a particular program to all television receiving apparatus authorized to reproduce that particular program. The respective modification key K_m

is transmitted via the telephone line 29, or on a predetermined broadcast channel separate and apart from the broadcast channel over which television program is transmitted, or is multiplexed with the television program. The television receiving apparatus stores the received modification keys in its memory (not shown) and/or in the authorization information area of the video or magnetic tape or in the storage device where the corresponding program is recorded. Prior to recording the received modification keys in the authorization information area, the television receiving apparatus performs error correction code encoding, such as adding parity data.

When a program is selected from a local store 45, e.g., a video tape in the digital VCR 7, hard disk, video disk or magnetic disk, the conditional access circuit determines if the television receiving apparatus is authorized to reproduce the selected program. The conditional access circuit reads from the memory (not shown) the authorization data associated with the selected program to determine if the television receiving apparatus is authorized to reproduce the selected program. If there is no authorization data in the memory associated with that program, then the conditional access circuit reads from the authorization information area of the local store 45 and performs error correction consistent with error correction code, for example, C1 code and/or C2 code.

If the authorization data associated with the selected program is present in either the memory or the authorization information area of the local store 45, a descrambler 44 of the conditional access circuit 13 descrambles the selected program with the stored modification key K_m using conventional descrambling techniques. The descrambled program data is then supplied to the MPEG decoder 14, which restores the

original video data and supplies the video data to the display unit 8 whereat it is displayed to the viewer.

As previously discussed, there is a risk in transmitting keys or program data in their original or 5 unencrypted form. Hence, in accordance with still another embodiment of the present invention, the modification key is encrypted with the personal key K_p before it is transmitted to the authorized subscriber.

Prior to transmitting the program data as 10 described hereinabove with respect to Fig. 3, the program data is scrambled at the broadcasting station by the scrambler 41 with the respective modification key K_m which is unique to each program data. The modification key K_m is itself encrypted at the broadcasting station by 15 the encryption unit 42 with the personal key K_p which is unique to each television receiving apparatus. The television receiving apparatus 6 cannot descramble the scrambled program data with the encrypted modification key K_m . It would be appreciated, therefore, that the 20 modification key is transmitted to the subscriber for each authorized program and is stored in the memory (not shown) and/or the authorization information area of the local store 45.

When a program is selected from the local store 25 45, the conditional access circuit determines if the television receiving apparatus is authorized to reproduce the selected program. The conditional access circuit reads from a memory (not shown) the authorization data associated with the selected program to determine if the 30 television apparatus is authorized to reproduce the selected program. If there is no authorization data in the memory associated with that program, then the conditional access circuit reads from the authorization information area of the local store 45 and performs error 35 correction consistent with error correction code, for example C1 code and/or C2 code.

If the authorization data associated with the selected program is present in either the memory or the authorization information area of the local store 45, a decryption unit 43 of the conditional access circuit 13 5 decodes (decrypts) the received modification key Km with the pre-stored personal key Kp and supplies the decrypted modification key Km to the descrambler 44 of the conditional access circuit 13. Decoding (decryption) of the modification key Km is effected by conventional 10 decryption techniques utilizing the pre-stored personal key Kp. The descrambler 44 then descrambles the selected program with the decrypted modification key Km using conventional descrambling techniques and supplies the descrambled program data to the MPEG decoder 14, 15 which restores the original video data and supplies the restored video data to the display unit 8 whereat it is displayed to the viewer.

The conditional access circuit 13 disables the operation of the digital VCR 7 and/or causes an 20 indication, such as the energization of an LED (not shown), to be displayed to the subscriber, indicating that the television receiving apparatus is not authorized to reproduce the selected program if the authorization data associated with the selected program is not present 25 in either the memory or the authorization information area of the local store 45. An additional level of security is provided by disabling the digital VCR 7 to prevent unauthorized access to the digital VCR 7, i.e., programs stored therein. The LED indication informs the 30 subscriber to access the authorization center 32 of the cable distribution system to obtain the necessary authorization to reproduce the selected program. If a smart card is not utilized, the subscriber must call the authorization center 32 to obtain the requisite 35 authorization to reproduce the selected program. If a smart card initialized with a predetermined monetary amount is utilized, then the subscriber simply places the

smart card in the smart card receiving unit 15 of the television receiving apparatus, from which is deducted the requisite fee for reproducing the program, thus, obviating the need to place a call to the authorization 5 center 32.

The present invention contemplates the existence of a service by which subscribers may rent or purchase a video directly from their cable service provider over the existing cable distribution system.

- 10 During off-hours (e.g., midnight or some other times specified by the subscriber), the cable service provider periodically transmits all currently available movies (or only those movies satisfying the previously established subscriber's preference such as foreign movies, movies
- 15 with G, PG, PG-13, R ratings etc.) with the corresponding authorization data to the subscribers' television receiving apparatus using one or a plurality of broadcasting stations in the cable distribution system. The television receiving apparatus records these movies
- 20 (programs) received during a selected time interval on digital video tapes to be viewed later by the subscriber. After recording these received movies, the television receiving apparatus rewinds the tape to the authorization information area to record the corresponding
- 25 authorization data. The selected time interval may be a day, a number of days, a week, a month, or a longer time interval. Typically, the time interval is a week and the television receiving apparatus thus stores movies released during the past week.

- 30 The subscriber selects a desired movie (program) to view by selecting the magnetic tape containing that movie (or by inserting the proper video tape into the digital VCR 7). If the authorization data associated with the selected program is present in either
- 35 the memory or the authorization information area of the selected video or magnetic tape, the conditional access circuit determines if the television receiving apparatus

has limited or complete authorization to reproduce the selected program. If such authorization status data for the selected program is complete authorization, the television receiving apparatus may reproduce the selected 5 program indefinitely without limitation. In fact, complete authorization status associated with the selected program enables other television receiving apparatus to reproduce the selected program even if the authorization data associated with the selected program 10 is not present in the memory of that other television receiving apparatus. Storing the authorization data on video tapes has the added advantage of allowing the viewers to share their videos with each other.

If the authorization status data of the 15 selected program is limited authorization, then the conditional access circuit determines if the rental period has expired for that video tape containing the selected program. The conditional access circuit reads from the memory (not shown) the expiration date data 20 associated with the selected program to determine if the rental period has expired. If there is no expiration date data in the memory associated with the selected program, then the conditional access circuit reads from the authorization information area of the selected video 25 or magnetic tape in the digital VCR 7. If the rental period has not expired on the video tape containing the selected program, the television receiving apparatus may reproduce the selected program until the rental period expires.

30 The microprocessor 33 of the conditional access circuit 13 reads clock data (not shown) to obtain the current date data. The microprocessor then determines if the rental period has expired by comparing the current date data and the expiration date data of the selected 35 program. The television receiving apparatus no longer is authorized to reproduce the selected program if the

expiration date of the selected program is prior to the current date.

If the rental period has expired, the television receiving apparatus cannot reproduce the selected program unless the rental period is extended or unless the authorization status of the selected program is changed to complete authorization. The subscriber can extend the rental period or change the status associated with the selected program to complete authorization by accessing the authorization center of the cable distribution system to authorize such change. Upon proper payment by the subscriber, the authorization center transmits new authorization data associated with the selected program to the subscriber's television receiving apparatus via the telephone line 29, or on a predetermined broadcast channel separate and apart from the broadcast channel over which television program is transmitted, or is multiplexed with the television program. If a smart card is utilized, the subscriber merely inserts the smart card into the smart card receiving unit 15 (shown in Fig. 2) and microprocessor 33 of the conditional access circuit 13 deducts the appropriate fee from the balance recorded on the smart card and sends the request to the authorization center 32 via modem 34 and telephone line 29 to extend the rental period or change the status of the selected program to complete authorization. This obviates the need to place a call to the authorization center 32 every time the subscriber wants to extend the rental period or change the status of the selected program.

While the present invention has been particularly shown and described with reference to a preferred embodiment, it will be readily appreciated that various changes may be made without departing from the spirit and scope of the invention. For example, the program information data need not be multiplexed onto one or more, or all of the channels that are receivable by

the television receiving apparatus, but rather, may be transmitted over a separate, distinct channel. Also, although the television receiving apparatus illustrated herein has been described as being present in a set-top 5 converter for cable or direct satellite broadcast distribution systems, or may be provided directly in a television receiver or video recorder, it is understood that such apparatus may be disposed in a separate stand-alone unit.

10 It is intended that the appended claims be interpreted as including the embodiments discussed above with reference to the drawings, those various alternatives which have been described and all equivalents thereto.

WHAT IS CLAIMED:

1. Apparatus for selectively inhibiting a television receiving device from recording programs, received as video data, which the apparatus is not authorized to record, comprising:
 - means for receiving video data;
 - a memory for storing program information associated with programs that are recordable by said television receiving device, said program information including authorization data indicating whether said apparatus is authorized to record said associated program;
 - means for reading from said memory the authorization data associated with said received program to determine if said apparatus is authorized to record said received program;
 - means for inhibiting said television receiving device from recording said received program if it is determined that said apparatus is not authorized to record said received program; and
 - means for recording said received program on a recording medium if it is determined that said apparatus is authorized to record said received program.
2. The apparatus of Claim 1, wherein said memory is operable to store said program information transmitted from a source.
3. The apparatus of Claim 1, wherein said means for recording is operable to record said program information on said recording medium.
4. The apparatus of Claim 1, wherein said recording medium is a video tape; and wherein said program information further includes tape identification data to uniquely identify said tape.
5. The apparatus of Claim 1, wherein said received data is encoded data; and wherein said means for recording includes decoding means for decoding said

received data prior to recording on said recording medium.

6. The apparatus of Claim 5, wherein said means for receiving is operable to receive a first key 5 associated with said received program transmitted from a source; wherein said memory is operable to store said first key transmitted from said source; wherein said means for reading is operable to read from said memory said first key associated with said received program; and 10 wherein said decoding means is operable to decode said received data with said first key.

7. The apparatus of Claim 6, wherein said first key is an encoded key, wherein said means for receiving is operable to receive a second key transmitted 15 from a source; wherein said memory is operable to store a second key; wherein said means for reading is operable to read from said memory said second key; and wherein said decoding means is operable to decode said first key with said second key so that said decoded first key can be 20 used to decode said received data.

8. The apparatus of Claim 7, wherein said second key is an encoded key, said means for reading is operable to read from said memory a pre-stored third key which is unique to said television receiving device; and 25 wherein said decoding means is operable to decode said second key with said third key so that said decoded second key can be used to decode said first key which is necessary to decode said received data.

9. The apparatus of Claim 1, wherein said 30 means for inhibiting is operable to prevent said television receiving device from accessing said recording medium.

10. Apparatus for selectively inhibiting a television receiving device from reproducing from a 35 recording medium video programs which the apparatus is not authorized to reproduce, comprising:

means for reading from a memory program information associated with programs that are reproducible by said television receiving device, said program information including authorization data

5 indicating whether said apparatus is authorized to reproduce said associated program;

means for selecting a program to be reproduced from said recording medium;

means for operating the means for reading to

10 read from said memory the authorization data associated with said selected program to determine if said apparatus is authorized to reproduce said selected program;

means for inhibiting said television receiving device from reproducing said selected program if it is

15 determined that said apparatus is not authorized to reproduce said selected program; and

means for reproducing from said recording medium said selected program if it is determined that said apparatus is authorized to reproduce said selected

20 program.

11. The apparatus of Claim 10, wherein said authorization data includes authorization status information indicating whether said apparatus has a limited or complete authorization to reproduce said

25 selected program, expiration date data representing the last date said apparatus with said limited authorization status is authorized to reproduce said selected program, and price data representing additional payment required to change the authorization status of said apparatus with

30 said limited authorization status to said complete authorization status.

12. The apparatus of Claim 11, wherein the means for reading means is operable to read the authorization status information associated with said

35 selected program to determine if said apparatus has the limited or complete authorization to reproduce said selected program; wherein the reproducing means is

operable to reproduce from said recording medium said selected program if it is determined said apparatus has the complete authorization to reproduce said selected program; and wherein the reading means is operable to 5 read the expiration date data associated with said selected program if it is determined said apparatus has the limited authorization to reproduce said selected program.

13. The apparatus of Claim 12, further 10 comprising means for generating current date data and means for comparing the current date data to said expiration date data associated with said selected program to determine if said apparatus no longer is authorized to reproduce said selected program; and 15 wherein the means for inhibiting is operable to inhibit said apparatus from reproducing said selected program if it is determined that said apparatus no longer is authorized to reproduce said selected program.

14. The apparatus of Claim 13, wherein said 20 means for inhibiting is operable to prevent said television receiving device from accessing said recording medium.

15. The apparatus of Claim 11, further comprising means for modifying the status information in 25 response to a change status command transmitted from a source.

16. The apparatus of Claim 10, wherein said 30 means for reading is operable to read from said recording medium said authorization data if it is determined that the authorization data associated with said selected program is not present in said memory.

17. The apparatus of Claim 10, wherein said recording medium is a digital video tape and wherein said 35 program information further includes tape identification data to uniquely identify said tape.

18. The apparatus of Claim 10, wherein said selected program on said recording medium is encoded

data; and wherein said means for reproducing includes decoding means for decoding said encoded data.

19. The apparatus of Claim 18, further comprising means for receiving a first key associated 5 with said selected program transmitted from a source; wherein said memory is operable to store said first key transmitted from a source; wherein said means for reading is operable to read from the memory said first key associated with said selected program; and wherein said 10 decoding means is operable to decode said encoded data with said first key.

20. The apparatus of Claim 19, wherein said first key is an encoded key; wherein said means for reading is operable to read from said memory a pre-stored 15 second key which is unique to said television receiving apparatus; and wherein said decoding means is operable to decode said first key with said second key so that said decoded first key can be used to decode said encoded data.

20 21. The apparatus of Claim 19, wherein said recording medium is operable to record said first key; and wherein said means for reading is operable to read from said recording medium said first key if it is determined that said first key associated with said 25 selected program is not present in said memory.

22. The apparatus of Claim 17, wherein said tape is operable to record said program information associated with programs recorded on said tape.

23. The apparatus of Claim 22, further 30 comprising means for generating a list of authorized programs and said tape identification data, each program being associated with respective tape identification data that identifies the tape on which that program is recorded; and means for comparing the tape identification 35 data of said tape to the tape identification data of said generated list to determine if the authorization data associated with said selected program is present in said

memory and wherein said reading means is operable to read from said tape the authorization data associated with said selected program if it is determined that said authorization data associated with said selected program 5 is not present in said memory.

24. The apparatus of Claim 10, wherein said means for inhibiting is operable to prevent said television receiving device from accessing said recording medium.

10 25. Apparatus for selectively inhibiting a television receiving device from recording and/or reproducing programs, received as video data, which are not authorized for viewing, comprising:

means for receiving video data;

15 a memory for storing program information associated with programs that are recordable and reproducible by said television receiving device, said program information including authorization data indicating whether said apparatus is authorized to record 20 and/or reproduce said received program;

means for reading from said memory the authorization data associated with said received program to determine if said apparatus is authorized to record said received program;

25 means for inhibiting said television receiving device from recording said received program if it is determined that said apparatus is not authorized to record said received program;

means for recording said received program on a 30 recording medium if it is determined that said apparatus is authorized to record said received program;

means for selecting a program to be reproduced from said recording medium;

means for operating the means for reading to 35 read from said memory the authorization data associated with said selected program to determine if said apparatus is authorized to reproduce said selected program;

means for operating the means for inhibiting to inhibit said television receiving device from reproducing said selected program if it is determined that said apparatus is not authorized to reproduce said selected 5 program;

means for reproducing from said recording medium said selected program if it is determined that said apparatus is authorized to reproduce said selected program.

10 26. The apparatus of Claim 25, wherein said memory is operable to store said program information transmitted from a source.

27. The apparatus of Claim 25, wherein said means for recording is operable to record said program 15 information on said recording medium.

28. The apparatus of Claim 25, wherein said recording medium is a video tape; and wherein said program information further includes a tape identification data to uniquely identify said tape.

20 29. The apparatus of Claim 25, wherein said received video data is encoded data; and wherein said means for recording includes decoding means for decoding said received program prior to recording on said recording medium.

25 30. The apparatus of Claim 29, wherein said means for receiving is operable to receive a first key associated with said received program transmitted from a source; wherein said memory is operable to store said first key transmitted from a source; wherein said means 30 for reading is operable to read from said memory said first key associated with said received program; and wherein said decoding means is operable to decode said received data with said first key.

31. The apparatus of Claim 30, wherein said first key is an encoded key, wherein said means for receiving is operable to receive a second key transmitted from a source; wherein said memory is operable to store a

second key; wherein said means for reading is operable to read from said memory said second key; and wherein said decoding means is operable to decode said first key with said second key so that said decoded first key can be
5 used to decode said received data.

32. The apparatus of Claim 31, wherein said second key is an encoded key, said means for reading is operable to read from said memory a pre-stored third key which is unique to said television receiving device; and
10 wherein said decoding means is operable to decode said second key with said third key so that said decoded second key can be used to decode said first key which is necessary to decode said received data.

33. The apparatus of Claim 25, wherein said
15 authorization data includes authorization status information indicating whether said apparatus has a limited or complete authorization to reproduce said selected program, expiration date data representing the last date said apparatus with said limited authorization
20 status is authorized to reproduce said selected program, and price data representing additional payment required to change the authorization status of said apparatus with said limited authorization status to said complete authorization status.

25 34. The apparatus of Claim 33, wherein the means for reading means is operable to read the authorization status information associated with said selected program to determine if said apparatus has the limited or complete authorization to reproduce said
30 selected program; wherein the reproducing means is operable to reproduce from said recording medium said selected program if it is determined said apparatus has the complete authorization to reproduce said selected program; and wherein the reading means is operable to
35 read the expiration date data associated with said selected program if it is determined said apparatus has

the limited authorization to reproduce said selected program.

35. The apparatus of Claim 34, further comprising means for generating current date data and 5 means for comparing the current date data to said expiration date data associated with said selected program to determine if said apparatus no longer is authorized to reproduce said selected program; and wherein the means for inhibiting is operable to inhibit 10 said apparatus from reproducing said selected program if it is determined that said apparatus no longer is authorized to reproduce said selected program.

36. The apparatus of Claim 35, wherein said means for inhibiting is operable to prevent said 15 television receiving device from accessing said recording medium.

37. The apparatus of Claim 35, further comprising means for modifying the authorization status information in response to a change status command 20 transmitted from a source.

38. The apparatus of Claim 25, wherein said means for reading is operable to read from said recording medium said authorization data if it is determined that the authorization data associated with said selected 25 program is not present in said memory.

39. The apparatus of Claim 25, wherein said selected program on said recording medium is encoded data; and wherein said means for reproducing includes decoding means for decoding said encoded data.

40. The apparatus of Claim 39, wherein said means for receiving is operable to receive a first key associated with said selected program transmitted from a source; wherein said memory is operable to store said first key transmitted from a source; wherein said memory 35 means for reading is operable to read from the memory said first key associated with said selected program; and

wherein said decoding means is operable to decode said encoded data with said first key.

41. The apparatus of Claim 40, wherein said first key is an encoded key; wherein said means for 5 reading is operable to read from said memory a pre-stored second key which is unique to said television receiving apparatus; and wherein said decoding means is operable to decode said first key with said second key so that said decoded first key can be used to decode said encoded 10 data.

42. The apparatus of Claim 40, wherein said recording medium is operable to store said first key; and wherein said means for reading is operable to read said first key from said recording medium if it is determined 15 that said first key associated with said selected program is not present in said memory.

43. The apparatus of Claim 28, further comprising means for generating a list of authorized programs and said tape identification data, each program 20 being associated with respective tape identification data that identifies the tape on which that program is recorded; and means for comparing the tape identification data of said tape to the tape identification data of said generated list to determine if the authorization data 25 associated with said selected program is present in said memory and wherein said reading means is operable to read from said tape the authorization data associated with said selected program if it is determined that said authorization data associated with said selected program 30 is not present in said memory.

44. The apparatus of Claim 25, wherein said means for inhibiting is operable to prevent said television receiving device from accessing said recording medium.

35 45. Method of selectively inhibiting a television receiving apparatus from recording programs,

received as video data, which the apparatus is not authorized to record, comprising the steps of:

receiving video data;

storing program information associated with

5 programs that are recordable by said television receiving device in a memory, said program information including authorization data indicating whether said apparatus is authorized to record said associated program;

10 reading from said memory the authorization data associated with said received program to determine if said apparatus is authorized to record said received program;

15 inhibiting said television receiving apparatus from recording said received program if it is determined that said apparatus is not authorized to record said received program; and

recording said received program on a recording medium if it is determined that said apparatus is authorized to record said received program.

20 46. The method of Claim 45, wherein the stored program information is received from a source.

47. The method of Claim 45, wherein the stored program information is further recorded on said recording medium.

25 48. The method of Claim 45, wherein said recording medium is a video tape; and wherein said program information further includes tape identification data to uniquely identify said tape.

49. The method of Claim 45, wherein said 30 received data is an encoded data and wherein the step of recording includes the step of decoding said encoded data prior to recording on said recording medium.

50. The method of Claim 49, further comprising the steps of:

35 receiving a first key associated with said received program transmitted from a source;

storing said first key transmitted from the source in said memory;

reading from said memory said first key associated with said received program; and

5 decoding said receiving data with said first key.

51. The method of Claim 50, wherein said first key is an encoded key; and further comprising the steps of:

10 receiving a second key transmitted from a source;

storing said second key in said memory;

reading from said memory said second key; and decoding said first key with said second key so

15 that said decoded first key can be used to decode said received data.

52. The method of Claim 51, wherein said second key is an encoded key and further comprising the steps of reading from said memory a pre-stored third key 20 which is unique to said apparatus; and decoding said second key with said third key so that said decoded second key can be used to decode said first key which is necessary to decode said received data.

53. The method of Claim 45, wherein the step 25 of inhibiting includes preventing said television receiving apparatus from accessing said recording medium.

54. Method of selectively inhibiting a television receiving apparatus from reproducing from a recording medium video programs which the apparatus is 30 not authorized to reproduce, comprising the steps of:

reading from a memory program information associated with programs that are reproducible by said apparatus, said program information including authorization data indicating whether said apparatus is 35 authorized to reproduce said associated program;

selecting a program to be reproduced from said recording medium;

reading from said memory the authorization data associated with said selected program to determine if said apparatus is authorized to reproduce said selected program ;

- 5 inhibiting said apparatus from reproducing said selected program if it is determined that said apparatus is not authorized to reproduce said selected program; and
- reproducing from said recording medium said selected program if it is determined that said apparatus
- 10 is authorized to reproduce said selected program.

55. The method of Claim 54, wherein said authorization data includes authorization status information indicating whether said apparatus has a limited or complete authorization to reproduce said selected program, expiration date data representing the last date said apparatus with said limited authorization status is authorized to reproduce said selected program, and price data representing additional payment required to change the authorization status of said apparatus with said limited authorization status to said complete authorization status.

56. The method of Claim 55, further comprising the steps of:

reading the status associated with said selected program to determine if said apparatus has the limited or the complete authorization to reproduce said selected program.

reproducing from said recording medium said selected program if it is determined said apparatus has the complete authorization to reproduce said selected program; and

reading the expiration date data associated with said selected program if it is determined said apparatus has the limited authorization to reproduce said selected program.

57. The method of Claim 56, further comprising the steps of:

generating current date data;
comparing the current date data to said
expiration date data associated with said selected
program to determine if said apparatus no longer is
5 authorized to reproduce said selected program; and
inhibiting said apparatus from reproducing said
selected program if it is determined that said apparatus
no longer is authorized to reproduce said selected
program.

10 58. The method of Claim 57, wherein the step
of inhibiting includes preventing said apparatus from
accessing said recording medium.

59. The method of Claim 55, further comprising
the step of modifying the status information in response
15 to a change status command transmitted from a source.

60. The method of Claim 54, further comprising
the step of reading from said recording medium said
authorization data if it is determined that the
authorization data associated with said selected program
20 is not present in said memory.

61. The method of Claim 54, wherein said
recording medium is a video tape and wherein said program
information further includes tape identification data to
uniquely identify said tape.

25 62. The method of Claim 54, wherein said
selected program on said recording medium is encoded
data; and further comprising the step of decoding said
encoded data.

63. The method of Claim 62, further comprising
30 the steps of:
receiving a first key associated with said
selected program transmitted from a source;
storing said first key transmitted from the
source in said memory;

35 reading from said memory said first key
associated with said selected program; and
decoding said encoded data with said first key.

64. The method of Claim 63, wherein said first key in an encoded key; and further comprising the steps of reading from said memory a pre-stored second key which is unique to said apparatus and decoding said first key 5 with said second key so that said decoded first key can be used to decode said encoded data.

65. The method of Claim 63, further comprising the steps of recording said first key on said recording medium and reading from said recording medium said first 10 key if it is determined that said first key associated with said selected program is not present in said memory.

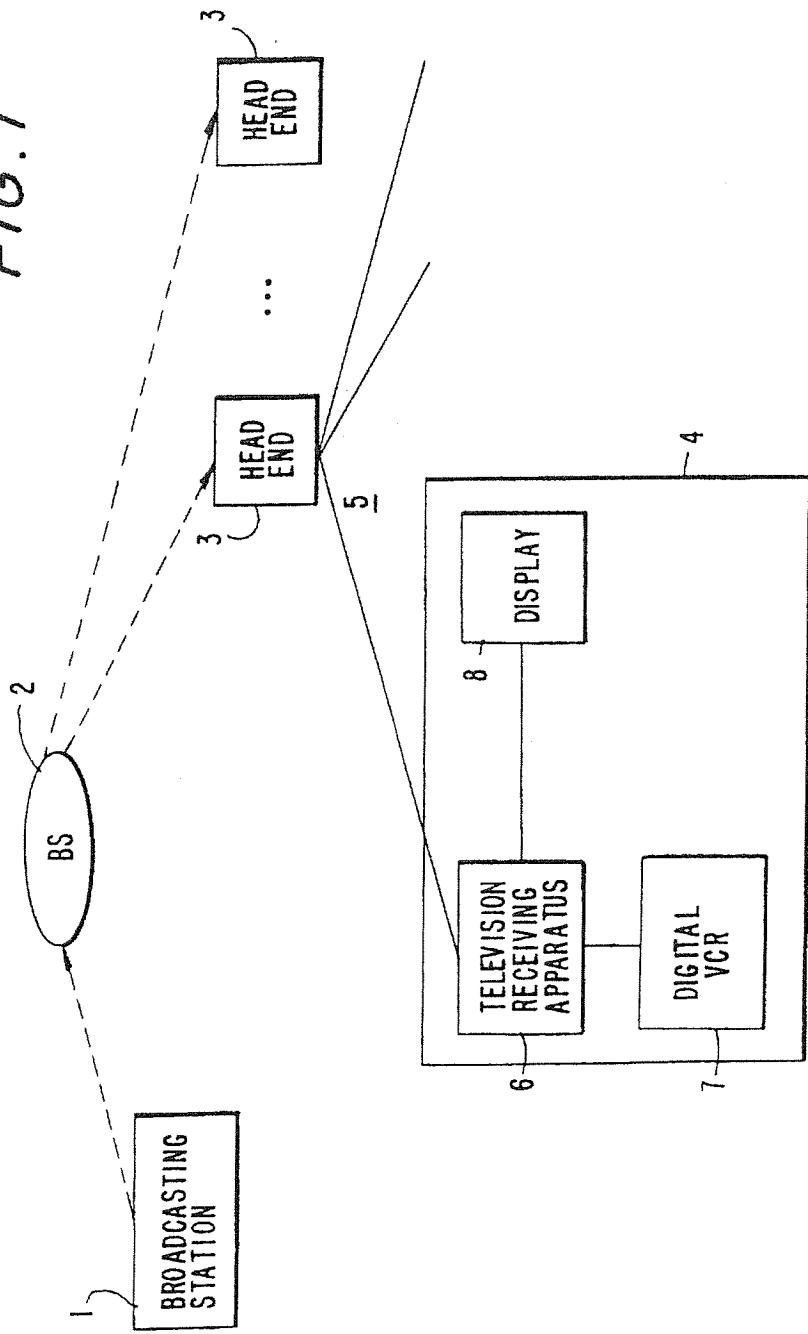
66. The method of Claim 61, further comprising the step of recording on said tape said program information associated with programs recorded on said 15 tape.

67. The method of Claim 66, further comprising the steps of generating a list of authorized programs and said tape identification data, each program being associated with respective tape identification data that 20 identifies the tape on which that program is recorded; comparing the tape identification data of said tape to the tape identification data of said generated list to determine if the authorization data associated with said selected program is present in said memory; and reading 25 from said tape the authorization data associated with said selected program if it is determined that said authorization data associated with said selected program is not present in said memory.

68. The method of Claim 54, wherein the step 30 of inhibiting includes preventing said apparatus from accessing said recording medium.

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FIG. 1



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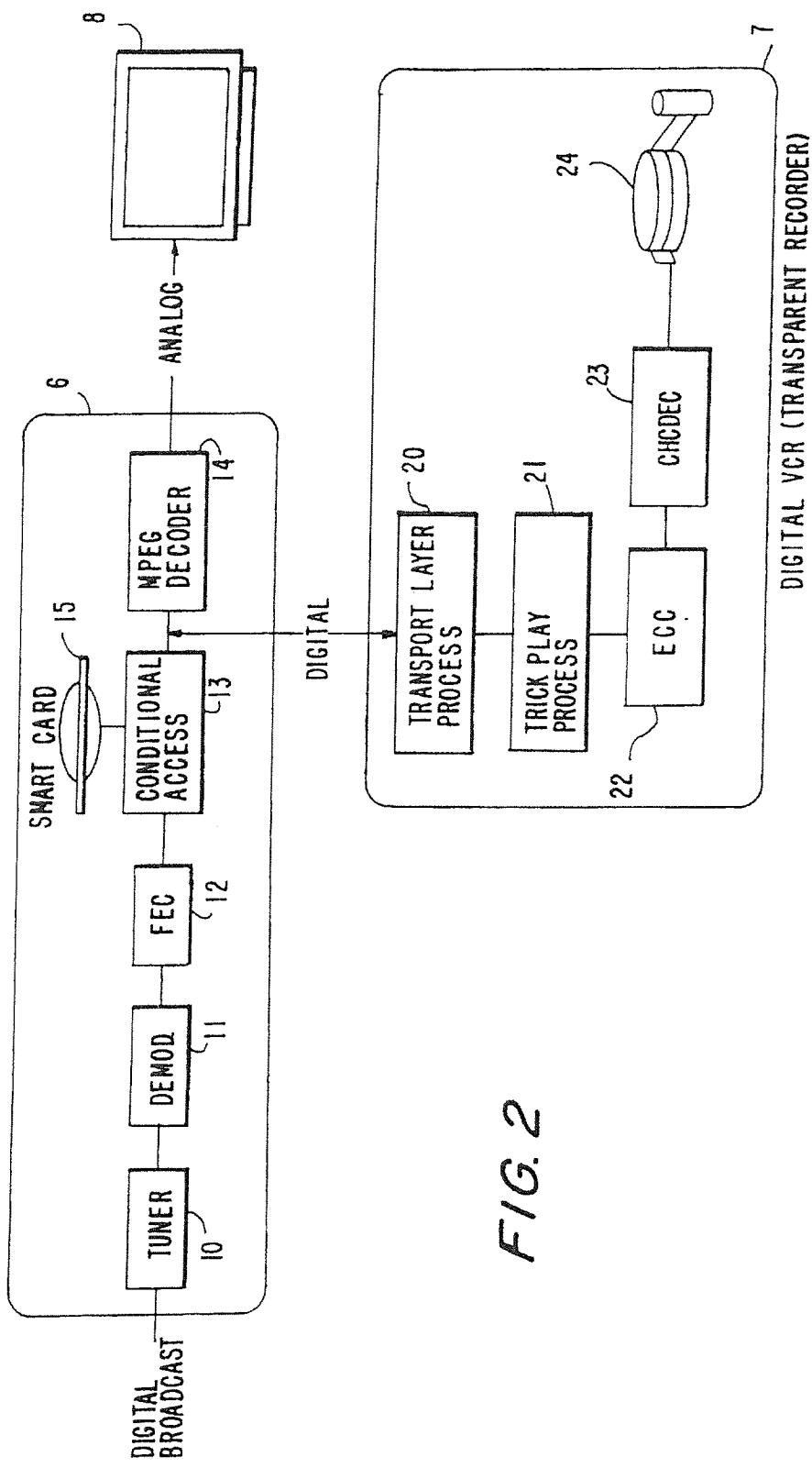


FIG. 2

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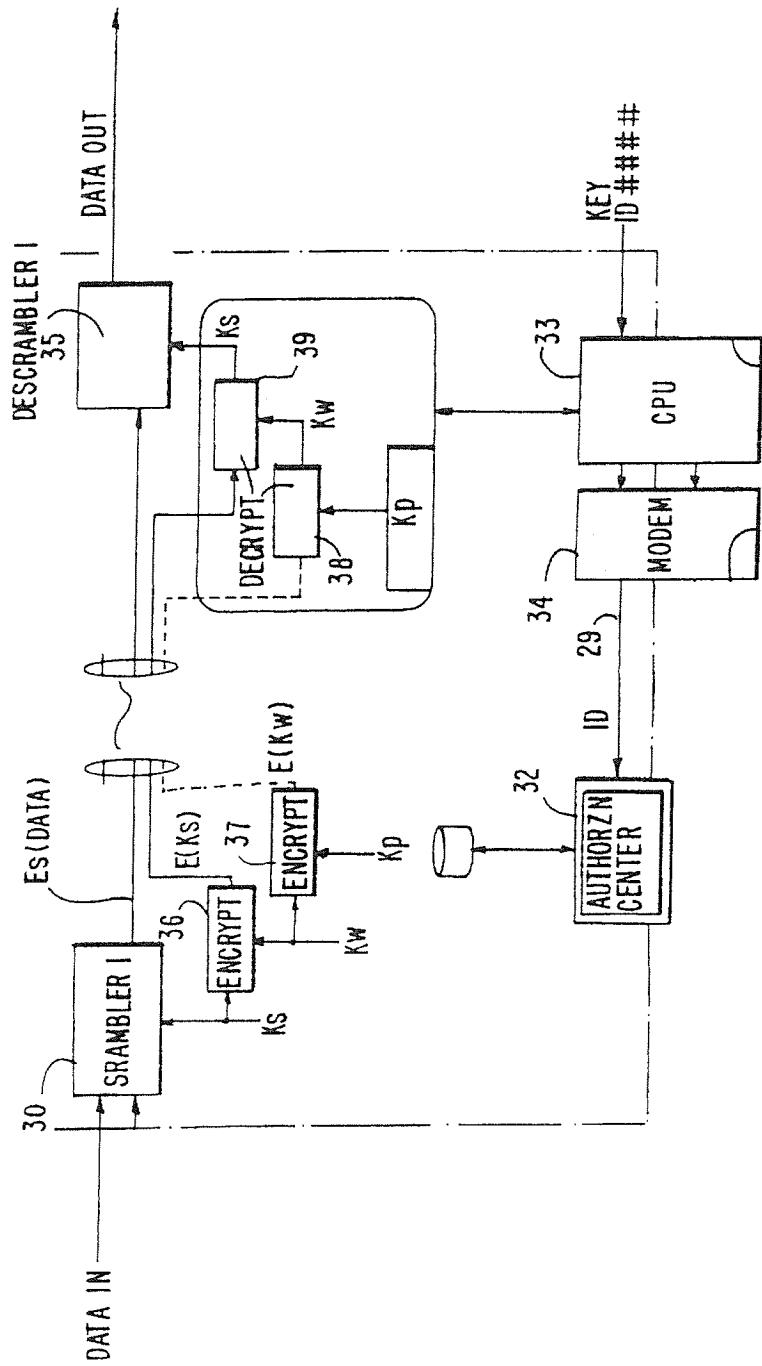


FIG. 3

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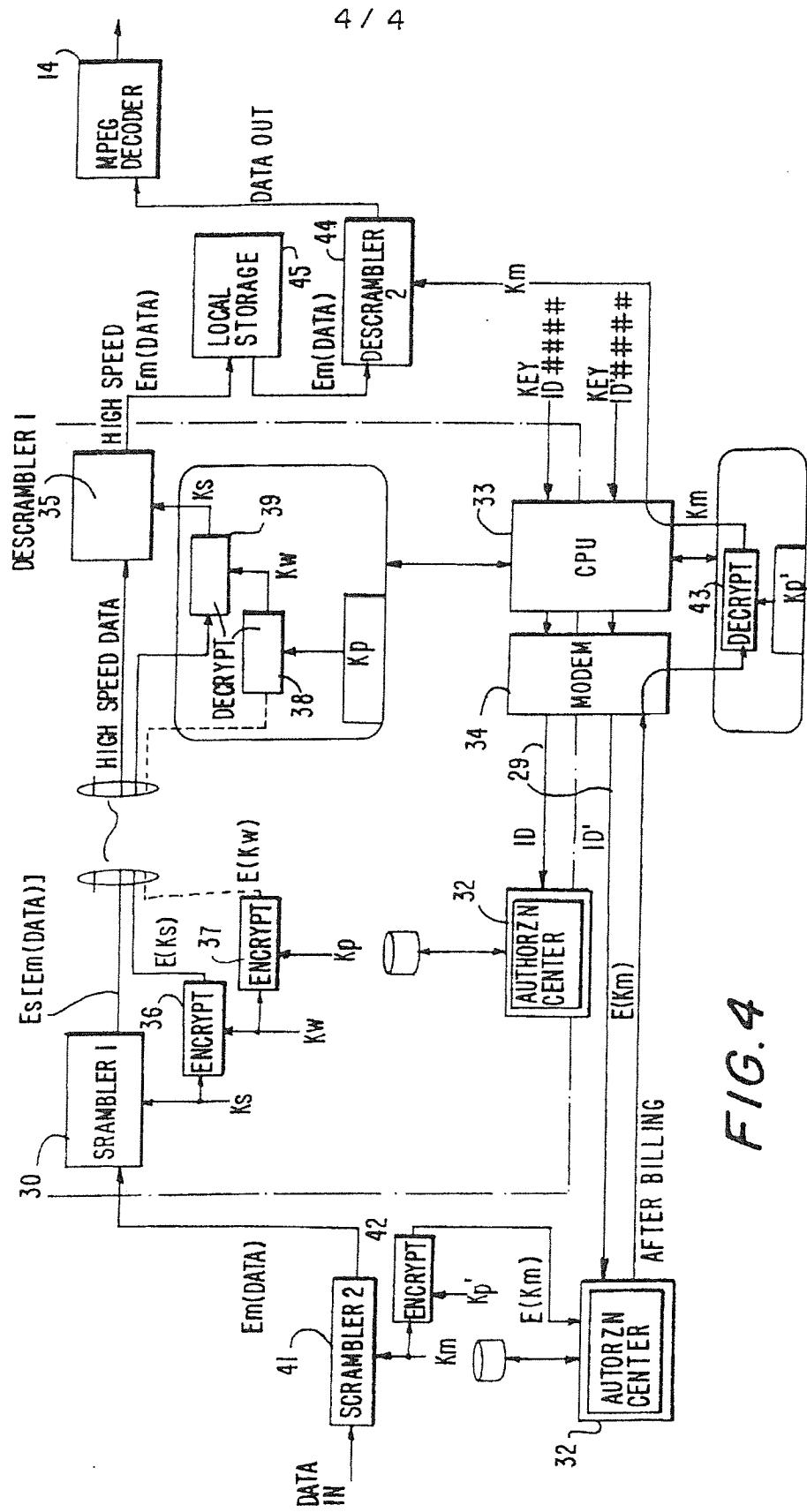


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/07981

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04N 5/91; G11B 5/86

US CL :386/94; 360/15

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 386/94, 83, 92, 46, 52, 4; 360/15, 13; 380/3, 10, 7, 11, 15

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4,520,404 A (VON KOHORN) 28 May 1985, col. 7, lines 15-41, and col. 8, lines 6-14.	1-2, 5-9, 45-46, 49-53
---		-----
Y		3, 4, 25, 26-32, 38-42, 44, 47-48
X	US 5,434,678 A (ABECASSIS) 18 July 1995, col. 26, lines 56-64	10,16, 18-21, 24, 54, 60, 62-65
---		-----
Y		3, 17, 22, 25-32, 38-42, 44, 47, 61, 66

 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be part of particular relevance	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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INTERNATIONAL SEARCH REPORT

International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,469,270 A (YAMAMOTO) 21 November 1995, col. 10, lines 15-18.	17, 22, 61, 66, 68, 4, 48, 28-32, 39-42, 44